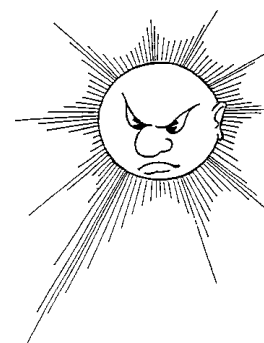


# Missouri Summer Weather Safety Week June 20 - 26, 2004



Two of the biggest weather hazards that affect the United States typically occur during the summer months: Lightning and Excessive Heat. The following table illustrates that pretty well.

**United States Average Deaths**

HEAT	LIGHTNING	TORNADO	FLOOD	HURRICANE
350	73	68	135	16

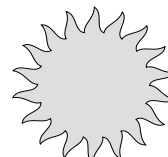
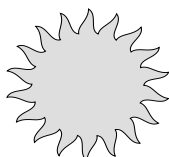
Table 1. Average number of fatalities per year due to weather phenomena over a 30 year period. The heat figure, 350, covers the period from 1979 to 1995.

## **Missouri Heat Related Deaths\***

Year	2003	2002	2001	2000	1999	1998	1997	1996	1995	1994
Deaths	17	27	39	22	92	12	9	7	57	14

\* Source: Missouri Department of Health and Senior Services (DHSS). For additional statistics and information visit the following DHSS site on the World Wide Web: [www.dhss.mo.gov](http://www.dhss.mo.gov)

The National Weather Service, the Missouri Department of Health and Senior Services, and the State Emergency Management Agency have joined together to promote **Missouri Summer Weather Safety Week**. This coincides with the **National Lightning Safety Awareness Week** which is also being held at the same time. The following pages include important safety information that can save peoples lives. Please help spread the word about Lightning and Heat Safety so we can have a safe summer.



## Lightning Overview

At any given moment, there are 1,800 thunderstorms in progress somewhere on Earth. This amounts to 16 million storms a year! In the United States, there are an estimated 25 million cloud-to-ground lightning flashes each year. While lightning can be fascinating to watch, it is also extremely dangerous.

### Underrated Problem

According to statistics kept by the National Weather Service, the 30 year average for lightning fatalities across the country is 73. Lightning usually claims only one or two victims at a time, and because lightning does not cause mass destruction, such as from a tornado event or a hurricane, lightning generally receives much less attention than the more destructive storm-related events. Due to under reporting, it is estimated that, more realistically, about 100 - 120 deaths per year occur because of lightning. Documented lightning injuries in the United States average about 300 per year; however undocumented lightning injuries are likely much higher.

In Missouri there have been 86 deaths attributed to lightning from 1959 - 2003, an average of 2 deaths per year. This is right behind the average of 3 deaths per year caused by tornadoes. Missouri ranks 17th nationally in lightning deaths per state.

While there were no deaths from lightning in 2003, in 2002, there were 5 people killed by lightning in Missouri. Four people died in one event in Willard, in Greene County. The people had taken shelter under a tree during a thunderstorm that was then struck by lightning. Another man died in Fenton, in St. Louis County at an athletic park while waiting to play a softball game. Another man suffered injuries to his upper body and face from a lightning strike in the Joplin area.

## Excessive Heat: Another Underrated Problem

Many people do not realize how deadly a heat wave can be. In contrast to the visible, destructive, and violent nature of floods, hurricanes, and tornadoes, a heat wave is a “silent killer”. In 1995 alone, 1021 Americans perished in heat waves, including 633 in Illinois and 57 in Missouri. The Centers for Disease Control and Prevention reports that an average of 350 people perish each year due to the effects of heat.

### What is a Heat Wave?

A heat wave is a period of excessive heat lasting two days or more that leads to illnesses and other stresses on people with prolonged exposure to these conditions. High humidity, which often accompanies heat in Missouri, can make the effects of heat even more harmful. While heat related illness and death can occur due to exposure to intense heat in just one afternoon, heat stress on the body has a cumulative effect. Consequently, persistence of a heat wave increases the threat to public health.

### The Urban Heat Problem

Most heat-related deaths occur in cities. **Brick and mortar buildings, asphalt streets, and tar roofs** absorb daytime heat and slowly release it at night. Consequently, temperatures in urban areas can be warmer than rural areas by several degrees both day and night. This is commonly called the urban “heat island” effect. In addition to the burden of heat, stagnant conditions often develop during heat waves, with pollutants increasing in concentration near the ground and contributing further to public health problems during heat waves.

Socioeconomic factors also place urban residents under extra risk. Some people in cities do not have air conditioning, while people in high crime areas may be afraid to open their windows or venture out to cooler public buildings.

## The Science of Lightning

Lightning has been seen in volcanic eruptions, extremely intense forest fires, surface nuclear detonations, heavy snowstorms, and in large hurricanes. However it is most often seen in individual thunderstorms. We know the cloud conditions necessary to produce lightning, but cannot forecast the location or time of the next stroke of lightning from a storm.

### Ice is critical to the Lightning Process

The formation of ice in a cloud appears to be a very important element in the development of lightning in a storm. The collision of ice and water particles causes separation of the positive and negative electric charges in the particles. Positive charged ice particles tend to collect in the upper parts of the storm, with negative charged particles in the middle and lower parts of the storm. These opposite charges attract, thus “in-cloud” lightning is often produced.

### Lightning to the Ground

As the negative particles gather at the bottom of the storm cloud, a pool of positively charged particles gather along the ground and travel with the storm. As the differences in charges increase, positively charged particles rise up taller objects such as trees, houses, and even people. If you are near a storm, and your hair stands on end, the particles are moving up you! The negative charged particles extend down from the cloud in “steps” and form a step leader. When it gets close enough to the ground or a tall object filled with positive particles, a channel is formed and an electrical transfer takes place. There can be several “strokes” which you see as flickering light. The channel heats to about **50,000 degrees Fahrenheit**, which is about 5 times hotter than the surface of the sun!. The rapid expansion of the heated air around the channel breaks the sound barrier, and you hear thunder.

One lightning stroke can generate between **100 million and 1 billion volts of electricity!**

## Who Is Most Vulnerable During a Heat Wave?

The elderly population segment is the most vulnerable to the dangers of heat. Of the 522 deaths that occurred in Chicago during the July 12-16, 1995 heat wave, 371 (73 percent) were age 65 or older. The elderly suffer due to the diminished ability to perspire. Since the function of perspiration is to provide evaporation, which in turn provides cooling, the elderly have a reduced capacity to release heat from the body.

In addition to the elderly, infants, young children, and people with chronic health problems (especially pre-existing heart disease) or disabilities are more vulnerable to the effects of heat waves. People who are not acclimated to hot weather, overexert themselves, are obese, or use alcohol or drugs (including drugs such as antipsychotics, tranquilizers, antidepressants, certain types of sleeping pills, and drugs for Parkinson’s disease) are at great risk. (Source- Centers for Disease Control and Prevention-Morbidity and Mortality Weekly Report)

### Measuring the Combined Effects of Heat and Humidity

The National Weather Service uses the **Heat Index (HI)** to compute the “apparent temperature,” which is a measure of how hot it feels to people at a certain combination of temperature and humidity. The heat index values used in forecasts, advisories, and warnings assume an average size adult, with light clothing, in the shade, with a 5 mile per hour wind. Being in full sun, or in an area with little air movement, can increase the apparent temperature, and thus increase the risk for adverse effects from the heat and humidity. Winds greater than 5 miles per hour usually enhance evaporative cooling and decrease the apparent temperature and the health threat from the heat. As noted, the impacts of heat are cumulative over time. The greatest number of heat-induced illnesses and fatalities usually peak two days after the maximum heat index values occurred.

The National Weather Service in St. Louis will issue **Heat Advisories** when a HI of 105 will be reached for at least 3 hours. A **Heat Warning** will be issued if the HI will reach 105 for at least 3 days or more, or if the HI will reach 115 on a day.

## Lightning Safety Awareness - An Educational Problem

While many people think they are aware of the dangers of lightning, the vast majority are not. Lightning can strike as much as 10 miles away from the rain area of a thunderstorm; that's about the distance that you are able to hear the thunder from the storm. While virtually all people take some protective actions during the most dangerous part of thunderstorms, many leave themselves vulnerable to being struck by lightning as thunderstorms approach, depart, or are nearby. Although some victims are struck directly by the lightning discharge, many victims are struck as the current moves in and along the ground.

A 1997 study by the National Oceanic and Atmospheric Administration (NOAA) of 35 years of USA lightning statistics showed the following:

1. **Location of lightning incident:** 40% Not reported, 27% Open field, 14% Under trees, 8% Water related, 5% Golf related, 3% Heavy equipment, 2.4% telephone related, 0.7% Radio, transmitter and antenna related

2. **Gender of Victims:** 84% Male, 16% Female

3. **Months of Most Incidents:** July 30%, August 22%, June 21%

A study co-sponsored by the National Center of Atmospheric Research and NOAA for the years 1959-2001 listed the top states for deaths and injuries.

**Deaths: Top 5 States:** Florida, Texas, North Carolina, Ohio, and New York (Missouri ranks 17<sup>th</sup>)

**Deaths & Injuries: Top 5 States:** Florida, Michigan, North Carolina, Pennsylvania, and New York (Missouri ranks 31st)

## Common Heat Related Disorders

Heat Disorder	Symptoms	First Aid
Heat Cramps	Painful spasms usually in muscles of legs and abdomen due to heavy exertion. Heavy sweating.	Stop activity and rest in a cool place. Lightly stretch or gently massage muscle to relieve spasms. Give sips of cool water.
Heat exhaustion	Heavy sweating. Skin cool, pale, and clammy. Pulse fast and weak. Breathing fast and shallow. Fainting, dizziness, vomiting, and nausea.	Get victim to a cool place. Have him/her lie down and loosen clothing. Apply cool, moist cloths. Give sips of cool water.
Heat stroke (sun stroke)	Temperature 103 or higher. No sweating, rapid pulse, fast and shallow breathing. Hot, red, dry skin. Nausea, dizziness, headache, confusion.	HEAT STROKE IS A SEVERE MEDICAL EMERGENCY. SUMMON EMERGENCY ASSISTANCE OR GET THE VICTIM TO THE HOSPITAL. DELAY CAN BE FATAL. Move the victim to a cooler environment. Use cool baths or sponging to reduce body temperature.

Table 2: A list of common heat-induced health problems and their suggested treatment (Reference: The American Red Cross)

## **Lightning Safety**

### **Outdoors**

- \* Remember, lightning can strike up to 10 miles from the rain area. Go quickly inside a completely enclosed building before the storm arrives. Do not go to a carport, open garage, covered patio or open window. A hard topped all metal vehicle also provide good protection
- \* If no shelter is available, do not take shelter under a tree. Avoid being the tallest object in the area. If only isolated trees are nearby, crouch down on the balls of your feet in the open, keeping twice as far away from a tree as it is tall.
- \* Get out of the water, off the beach, and out of small boats or canoes. Avoid standing in puddles of water even if wearing rubber boots.
- \* Do not use metal objects such as golf clubs, metal bats, fishing rods, or metal tools.
- \* Stop tractor work and heavy construction equipment, especially when pulling metal equipment.

### **Indoors**

- \* Stay there! The best protection from lightning is a house or other substantial building. However, stay away from windows, doors, and metal pipes.
- \* Do not use electric appliances during the storm. Turn off sensitive equipment such as televisions, VCR's, and computers.
- \* Telephone use is the leading cause of indoor lightning injuries in the United States. Do not make a call unless it is an emergency.

## **Excessive Heat Safety**

- \* Drink plenty of water and natural fruit juices, even if you're not thirsty. Avoid alcoholic beverages and drinks with caffeine, such as coffee, tea, and colas.
- \* Wear loose-fitting, lightweight, light-colored clothing. If you must go out, use sunscreen and wear a wide-brimmed hat. Remember that sunburn reduces the skin's ability to provide cooling.
- \* Avoid going out during the hottest times of the day. Take frequent breaks if working during the heat of the day.
- \* Using a buddy system between co-workers in high heat-stress jobs can help ensure that signs of heat stress do not go unnoticed.
- \* Inside during the day, keep shades drawn and blinds closed. Use air conditioning whenever available. Even just two hours per day in air conditioning can significantly reduce the risk of heat-related illness.
- \* Fans should only be used in a ventilated room. Blow hot air out a window with a fan during the day, and blow in cooler air at night.
- \* Take cool (not icy cold) baths or showers. Eat frequent, small meals. Avoid high protein foods, which increase metabolic heat. Fruits, vegetables, and salads constitute low protein meals.
- \* Do not leave children or pets in a closed vehicle with the windows up. Temperatures inside a closed vehicle can reach over 140 degrees within minutes.
- \* Provide extra water and access to a cool environment for pets.
- \* Listen to NOAA Weather Radio or media sources to keep up with the latest heat watches, warnings, and advisories.

Relative Humidity (%)													
T	40	45	50	55	60	65	70	75	80	85	90	95	100
110	136												
108	130	137											
106	124	130	137										
104	119	124	131	137									
102	114	119	124	130	137								
100	109	114	118	124	129	136							
98	105	109	113	117	123	128	134						
96	101	104	108	112	116	121	126	132					
94	97	100	103	106	110	114	119	124	129	135			
92	94	96	99	101	105	108	112	116	121	126	131		
90	91	93	95	97	100	103	106	109	113	117	122	127	132
88	88	89	91	93	95	98	100	103	106	110	113	117	121
86	85	87	88	89	91	93	95	97	100	102	105	108	112
84	83	84	85	86	88	89	90	92	94	96	98	100	103
82	81	82	83	84	84	85	86	88	89	90	91	93	95
80	80	81	81	82	82	82	83	83	84	85	86	86	87

The Heat Index (Apparent Temperature) can be found by taking the temperature (number on the left) and relative humidity value (number at the top) and matching them on this table. For example, a temperature of 90 degrees Fahrenheit and a relative humidity of 45 percent gives you a heat index of 93 degrees.

For Additional information  
visit

**<http://www.crh.noaa.gov/lx/vortex/wcm.htm>**  
**Click on *Summer Weather Safety Week 2004***

**<http://www.lightningsafety.noaa.gov>**